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AUTHOR Burt, Thomas
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ABSTRACT

The intent of this field tested instructional package is to familiarize the student with the maintenance and services elements of industry and their function in the production of goods and services. Defining behavioral objectives, the course description includes a media section, suggested classroom activities, and sample student evaluation forms, as well as the basic information section. Included is a definition of maintenance and service as it relates to industry. The package explains the difference between product maintenance and plant maintenance. The significant functions of, and reasons for, plant maintenance are also discussed in this package. (Author/MW)

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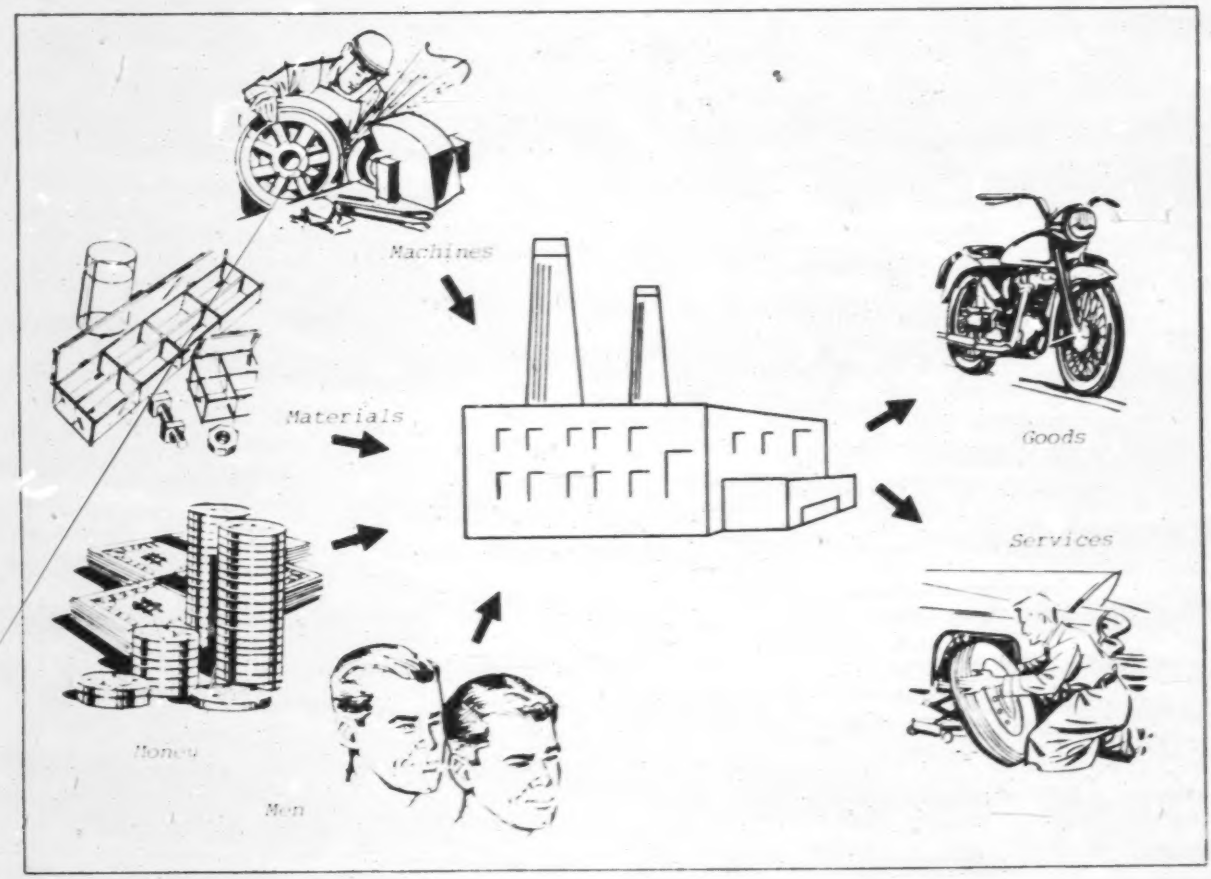
# MAINTENANCE AND SERVICES




Prepared as an Aid in Implementing
The Wisconsin Guide to Local Curriculum
Improvement in Industrial Education, K-12

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Learning Activity Package

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# Maintenance and Services

Junior-Middle High School

Pertaining to Field Objective Number One

"To work with the elements of maintenance
and services to gain an understanding
of how they function in modern industry."

Produced by

The Industrial Education Instructional
Materials Development Project
University of Wisconsin-Stout
Menomonie, Wisconsin

Project Director:

Lawrence S. Wright, Ed.D.

Assistant Director:

M. James Bensen, Ed.D.

Project Coordinator:

John M. Ritz, M.S.

Contributor to this Package:

Thomas Burt

Supported by:

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RATIONALE:

In this lesson you will study the element or part of industry which is called maintenance and services. These are activities which perform the functions of servicing property, equipment and people. Maintenance and service are very important factors in modern industry - so important, in fact, that over half of all American workers are employed at jobs which provide maintenance and service.

There is a very good chance that you will work at a maintenance or service type job someday. If you have a paper route or have worked for your neighbors shoveling sidewalks or mowing lawns, you have already experienced this kind of employment. But even if you never do, maintenance is basic to your way of life, and by studying it, you will better understand its importance to you and its essential force in modern industry.

Turn to the next page and read the objectives carefully!!

OBJECTIVES:

Terminal Objective:

To work with the element of maintenance and services to gain an understanding of how it functions in modern industry.

Enabling Objectives: At the conclusion of this package, you should be able to meet these objectives:

1. Define services as it is used to describe a major part of the industrial economy.
2. Define maintenance as the term is used in industry.
3. In writing, distinguish between product maintenance and plant (or industrial) maintenance.
4. Identify the most significant reasons why plant maintenance is important to an industrial firm.
5. Identify the functions of plant maintenance.
6. Identify two maintenance factors which a manufacturer should consider when he produces a product.
7. Identify three ways in which a manufacturer can provide for the future maintenance of his product.

Options: Read the self-test on the following pages and then check the following selections that apply to you.

___ If you feel that you can meet the above objectives:

___ A. See the instructor for teacher evaluation.

___ B. Take the self-test as a self evaluating device, then see your instructor.

___ If you feel that you cannot meet the above objectives:

___ A. Take the self-test to see what objectives your studying should be based upon, then turn to the media section on page 5.

___ B. Skip the self-test and turn to the media section on page 5 to help you achieve the objectives.

Self-Test: You may write in this booklet.

1. Define services as the term is used to describe the service sector of an industrial economy.

2. Define maintenance as the term is used in industry.

3. Briefly tell the difference between plant maintenance and product maintenance.

4. Select from the following statements those which describe why plant maintenance is important to a company.

   A. Today, more machines are being used which are also more complex.

   B. Some machines require the labor of many workers.

   C. Well maintained plants and equipment make for safer places to work.

   D. Maintenance crews are easy to call on for major construction and expansion of the plant.

   E. Clean, well kept work places are more attractive and pleasant.

5. Is the statement true or false?

   T F A. One of the most important jobs of the maintenance department is the prevention of breakdown or deterioration of a plant, its grounds, or the equipment.

   T F B. Emergency repairs to equipment in a plant are usually performed by contractors.

   T F C. The daily greasing and inspection of a 50 ton press is an example of preventative maintenance.

   T F D. While clean-up is important to a business, it is rarely considered a part of industrial maintenance.

   T F E. One could expect maintenance workers to be bored with their work because there is so little variety in the tasks they perform.

6. Select the two maintenance factors which best illustrate the considerations a manufacturer should make when he designs a product.

   A. The convenience of performing maintenance on the product.

   B. The amount of maintenance the product will require during its useful life.

C. The time it will take to perform maintenance on the product.

D. The skill required to perform maintenance on the product.

7. List three ways which a manufacturer can provide for the future maintenance of his product.

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MEDIA SECTION

Objective Number 1: You will define service as it is used to describe a major part of the modern industrial economy.

Optional Media: Choose one or more!

___ 1. Read the information found on pages 7 to 8 of this package.

___ 2. Read Trends in Employment in the Service Industries, George J. Stigler, Princeton University Press, 1956, pp. 47-50.

___ 3. Read The Service Economy, Victor R. Fuchs, Columbia University Press, 1968, pp. 14-17.

Activity: Perform this activity: Maintenance and Services-I-1.

Objectives Number 2 and 3:

2) You will define maintenance as the term is used in industry.

3) You will describe the difference between plant (or industrial) maintenance and product maintenance.

Media: Read the information section found on pages 8 to 9.

Optional Activities: Choose one or more from Activities: Maintenance and Services - I-2A and 2B.

Objectives Number 4 and 5:

4) You will recognize the importance of plant maintenance to a firm.

5) You will identify the major functions of plant maintenance.

Media: Read the information section found on pages 9 to 11.

Optional Activities: Choose one or more from Activities: Maintenance and Services - I-3A and 3B.

Objectives Number 6 and 7:

6) You will identify two maintenance factors which a producer should consider when he designs a product.

7) You will identify three ways in which a manufacturer could provide for maintenance of his product.

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Media: Read the information section found on pages 12 to 14.

Optional Activities: Choose one or more from Activities - Maintenance and Services - I-4A and 4B.

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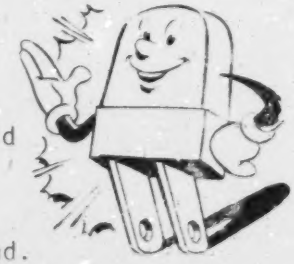
INFORMATION SECTION

What are Services?

The part of a modern industrial economy, such as the United States', which we describe with the term services, is very broad. The service sector of the American economy includes more than half of the work force. This means that over 40 million Americans are employed in service type jobs.

In defining the service sector, we could say that it includes all industries which provide services, but we still would not have a very clear picture of it. First let's look at what services are not. We could start by dividing the American Economy into two categories: the agricultural sector and the industrial sector.

Farming and ranching, forestry, and commercial fishing and hunting are the major economic activities in the agricultural sector. The "Industrial" category includes mining, manufacturing and public utilities such as gas, electricity, and water. All of the economic activities which do not fit into "Agriculture" and "Industry" we could classify as in the service sector.



The service sector, as we said, however, is very broad. Now let's look at the activities that are found here. One big category of services is transportation. This includes transportation of people and transportation of material goods. A second group of service activities is wholesale and retail trade. Banking, insurance, real estate, legal services, accounting and bookkeeping, and engineering are a third set of

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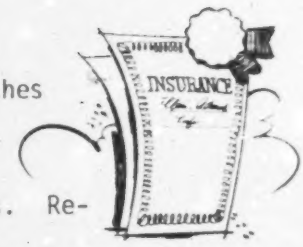
services. In our communities we find such local services as schools, clinics and hospitals, churches and synagogues, welfare organizations, libraries and museums, and labor unions. Recreational activities including motion pictures, theaters, and concerts are all services. So too are domestic services, restaurants, cafes and taverns, hotels and campgrounds, laundries, barber and beauty shops, repair shops and portrait studios. As you can see, the services are many and diverse.



Of course, every time you think of services, you are not likely to go through such a list in defining it. You need a brief definition which will basically tell you what the common and essential attributes of service activities are. Here is one which should be useful: "Service is useful labor which does not produce a tangible commodity." (A tangible commodity generally refers to one which can be touched. For example, an automobile is a tangible commodity, but the transportation of the car from factory to dealer is intangible. Sometimes tangible commodities are called material commodities).

What is Maintenance?

The activities in the economy which involve the labor of keeping something in a state of repair or efficiency are commonly called maintenance activities. These activities are a subject of the service sector of the economy which you have been introduced to. Typically maintenance has to do with care and upkeep of buildings, equipment, grounds, personal property, etc.

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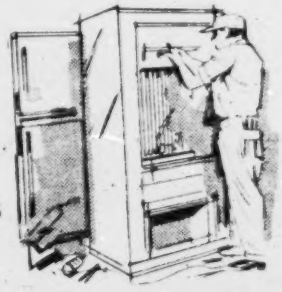
Plant Maintenance and Product Maintenance

Although there are a vast number of ways in which maintenance is performed in our society, in this lesson we will look at two kinds of maintenance. These two kinds of maintenance are plant maintenance and product maintenance.



First consider maintenance as it is performed within a manufacturing plant, (or a farm or a school or any other business or organization that has buildings and equipment). This kind of maintenance is that performed on the facilities of the plant to keep it functioning properly. Such activities include routine and emergency repairs to equipment, and clean-up and periodic servicing. These activities are performed in order to keep the plant in operation producing its product, but not to actually produce the product itself.

Secondly, consider the maintenance of the product which is marketed and sold to a buyer or consumer. This is maintenance, usually performed outside of the plant, on the product after it has been bought and used by someone. It is likely to be done in a repair shop or service center. It could also be done in a home or a business place by a serviceman. The repair of a leaking water pipe in your home by a plumber is one example. Putting new heels on your shoes at the shoe shop is another example of this kind of maintenance.

Importance of Plant Maintenance

Plant maintenance, sometimes called industrial maintenance, is

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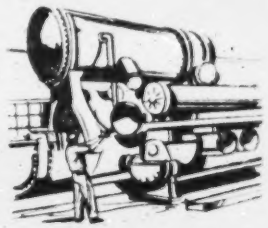
of increasing importance in modern industry. In the United States, industrial plant and equipment maintenance costs over $20 billion per year. This is about 5 percent of the average industrial sales dollar. The rise in the importance of maintenance primarily stems from the mechanization and automation of industry. Industry is using more machines and these machines often are more complex. This requires more maintenance and skilled servicing.



More complex machines are usually also more costly, not only in purchase price, but also in cost of operation. For example, a large machine may require many people to operate it. If it breaks down, the owner not only looses the machine's output, but he also has to keep paying the workers who are not producing. You can see the importance of keeping such a machine operating.

Kinds of Plant Maintenance

The job of maintaining a plant involves several types of activities or tasks. For example, if the complex machine mentioned above broke down, the plant would have a maintenance emergency, and the maintenance people would be asked to work very hard to get the machine operational again. Most of the maintenance activities are not so dramatic, however. They are aimed at preventing such a breakdown.

The maintenance crew in a typical industrial plant will have to be able to perform many different activities. We have already mentioned emergency repair. More typically, repair will be of a routine nature and will include regular and periodic parts replacement and

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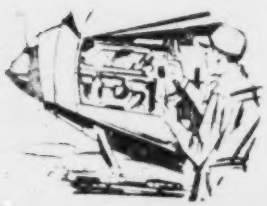
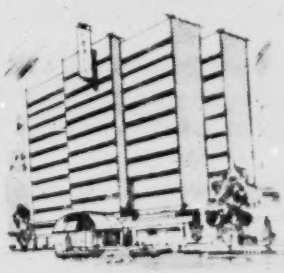
repair of machines, and routine repair of buildings, grounds and utilities. One example of this kind of maintenance is the painting of buildings. Another is the overhauling of a machine after a determined number of hours of operation. This would prevent a breakdown because it would be repaired before its condition reached the point of breakdown. Think of an example of the importance of this type of maintenance on an airliner.



If overhauls weren't performed before breakdown, the results would likely be a disasterous accident.

The maintenance department is often called upon to install new equipment, to make parts for equipment, to remove or add on to buildings or parts of buildings. This might be as simple a project as moving a light fixture or as complex a task as putting in an air conditioning system. Very large projects, however, are usually contracted to another business.

One set of very important tasks of the maintenance crew are those called preventative maintenance. These are the seeminaly minor activities which are performed so that things will continue to operate smoothly. They include inspection and adjustment of machines, oiling and lubrication, and minor repairs to defects discovered in inspection and clean-up. Clean-up is the basis of a good maintenance program. For clean machines run better longer and clean buildings are safer and more attractive places to work. Can you imagine this school if no one carried out the garbage or swept the floors for a month!



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Product Maintenance

You have seen how maintenance within an industrial plant is important to production. Now we will look at maintenance as it applies to the production of a plant <u>after</u> it has been marketed and sold. Do you think this kind of maintenance is important to a manufacturer?

Most manufacturers are very much concerned about the performance of their product in the hands of their customers, because future sales will depend upon consumer satisfaction. In fact, survival of a firm depends to a large degree upon its reputation for the quality of its product. The reputable firm then is just about always one which has expended a great deal of effort on the question of maintenance.

There are two major considerations a manufacturer should make in designing his product. He first should consider the <u>amount of maintenance his product will require throughout its useful life</u>.

Ideally all products would never require maintenance. Most flashlight batteries, for example, never require maintenance; we simply use them till they fail and then replace them. Obviously this is not always possible. Most products will require some maintenance. The question for the manufacturer is how good his product must be in terms of long life and maintenance required during that life. Automobiles are examples of products which require considerable periodic maintenance and repair, although our newer models require less care than those of several years ago.

The second important consideration in product

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design is the allowances made for future maintenance. If a product is likely to require service or repair during its use, then it should be designed so that the work on it can be done easily. Many products score rather poorly on this issue, and consequently repairs are difficult and costly. Many new cars are difficult to work on because the designers did not allow for convenience of maintenance.

The manufacturer can do several things, in addition to the design of the product, to ensure that his customers receive good service from their purchases. He can provide customer service centers. These are repair shops where a customer can bring the product for periodic service or repair. The service department of the new car dealer is such a service center. Sometimes the service center is simply a point for dropping off the product. Actual repair may be done elsewhere. In some cases the product may be sent back to the factory for repair.

The manufacturer can also provide a customer complaint department. This is simply some readily accessible channel of communication to the manufacturer. For example, some companies have toll-free telephone numbers which customers can use to report their dissatisfactions to them. These, of course, must be followed-up with correction of the problem. One important provision for satisfactory performance is the guarantee of a product. This is a promise to repair or replace a malfunctioning product, and is an assurance to a customer that the product is a good one and can be bought with confidence.

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The maintenance records of products provide a manufacturer with a "report card" on his performance as a producer. But to find out how good a job he did in his production of his product requires some special efforts. Some manufacturers use surveys of customers to find out about the product's performance. The number of complaints received is another means of evaluating the product. Records of service can be used to grade product performance as can the demand for replacement parts.

The importance of maintenance of a product after its sale should now be apparent to you. Through concern for easy, economical maintenance, the producer assures the satisfaction of his customers. Satisfied customers will return to purchase his products again and this will enhance his reputation, thereby supplying him with new customers. The result will be more business for his firm.

To the Instructor: Several of the activities in this package will require advance planning and coordination on your part. For example, for activities:

I-2A: Coordinate with the custodial staff for the student's maintenance experience.

I-2B: Be ready to suggest appropriate appliances for repair in the lab.

I-3A: Set up a student lab maintenance plan for those who choose this activity. Emphasize the "maintenance department" angle.

I-4B: Provide the organization of activities for the repair shop project.

Activity: Maintenance and Service - I-1 Name _____

Period _____

## What is Service?

1. What is the definition of service?

2. In the first column on the chart below, list at least 15 employed people whom you know that work at jobs which fit this description.

3. List the job title or name of the person's job as you know it next to the person's name in the second column

4. List the service industry next to the job title in the third column.

| Name | Job Title | Service Industry |
|---|---|---|
| 1. | | |
| 2. | | |
| 3. | | |
| 4. | | |
| 5. | | |
| 6. | | |
| 7. | | |
| 8. | | |
| 9. | | |
| 10. | | |
| 11. | | |
| 12. | | |
| 13. | | |
| 14. | | |
| 15. | | |

Activity: Maintenance and Service - I-2A Name _____

Period _____

## What is Maintenance?

People performing maintenance are all about us. One way you can find out about maintenance is by doing some yourself.

Procedure. Spend two or three hours of your class lab time helping one of the custodians maintain the school. See your instructor for assignment with one of the custodians.

Activity: Maintenance and Service - I-2B Name _____

Period _____

## What is Maintenance?

People all about us are performing maintenance. One way to learn about maintenance is to do some yourself.

Procedure: Bring a small appliance which needs repair from home and perform those repairs. First tell your instructor that you have chosen this activity. He will suggest some possible appliances which you can repair in the lab.

Activity: Maintenance and Service - I-3A Name _____

Period _____

## Plant Maintenance

You will participate with other class members in a lab maintenance project. As a member of the class maintenance department, you will be assigned duties such as clean-up, tool maintenance and repair, painting, minor construction, inspection, and supervision.

Procedure: Sign up for this activity on the class maintenance department roster in the instructors office.

Activity: Maintenance and Service - I-3B Name _____

Period _____

## Plant Maintenance

Waste disposal is a major task in the maintenance of an industrial plant. Ask one of the school's custodial staff members and he will probably tell you that it's a big job here, too.

Procedure:

1. List the wastes of this school in the following categories:

   Paper and dry waste:

   Garbage and perishable waste:

   Other waste products:

2. Estimate the amount (weight or volume) of the waste materials from this school.

Activity: Maintenance and Services - I-4A Name _____

Period _____

## Product Maintenance

Design a maintenance schedule for a bicycle, motor bike, snowmobile or other machine.

Procedure:

1. Consult a motorcycle or automobile owner's manual or any other source you can think of for ideas for the schedule.

2. List the maintenance tasks and also the frequency in which they should be performed.

Activity: Maintenance and Service - I-48 Name _____

Period _____

## Product Maintenance

You will participate with other members of the class in a repair shop project. As a worker in the repair shop, you will collect small appliances and tools in need of repair from fellow students, teachers, parents and neighbors and put them in operating condition.

Procedure: Sign up for this activity on the class Repair Shop Project Roster in the instructors office.

Self Test Key:

1. Service is useful labor which does not produce a tangible or material commodity.

2. Maintenance is the care and upkeep of buildings, equipment, roads and grounds, personal property, etc; or the labor of keeping something in a state of repair and efficiency.

3. Plant maintenance is also called industrial maintenance and refers to the maintenance performed within an industrial plant or other organization on its material assets or facilities to keep it functioning properly.

   Product maintenance refers to the maintenance performed on some material product after it has been marketed and sold to a consumer.

4. A, B, C and E are correct choices.

5. A. True
   B. False
   C. True
   D. False
   E. False

6. A and B

7. Design of a product
   Customer service centers
   Factory service and repair
   Customer complaint department
   Guarantee

Student Evaluation

Maintenance and Service - I

Name _____

Instructor _____

School _____

Directions: Answer all of the following questions to the best of your ability. The questions are written to evaluate your knowledge and understanding of the area of industrial arts covered in this package. Choose the answer which best completes the statement.

1. Maintenance and services may be defined as:

   a. Useful labor which does not produce a real product
   b. Keeping something in a state of repair
   c. All of the above
   d. None of the above

2. The care and upkeep of buildings, equipment, grounds, and personal property is referred to as:

   a. Maintenance
   b. Service

3. Over half of all American workers are employed at jobs which provide maintenance and service

   a. True
   b. False

4. Plant maintenance includes:

   a. Routine and emergency repairs to equipment
   b. Clean-up
   c. Periodic servicing
   d. All of the above

5. Preventative maintenance involves

   a. Oiling and lubrication
   b. Clean-up
   c. Inspection and adjustment of machines
   d. All of the above

6. While clean-up is important to a business, it is rarely considered a part of industrial maintenance.

   a. True
   b. False

7. Emergency repairs to equipment in a plant are usually performed by contractors.

   a. True
   b. False

8. Maintenance records of products provide a manufacturer with a "report card" on his performance as a producer.

   a. True
   b. False

9. Considerations which should be allowed for where products are designed are:

   a. The amount of maintenance the product will require throughout its useful life
   b. Allowances for future maintenance
   c. Cost of repair
   d. All of the above

10. The maintennace crew in a typical industrial plant will have to be able to perform many different activities.

    a. True
    b. False